

EXPLANATION OF SIGNIFICANT DIFFERENCES

FOR THE

NYANZA CHEMICAL WASTE DUMP SUPERFUND SITE
(Operable Unit 2)

ASHLAND, MASSACHUSETTS

PUBLIC COMMENT DRAFT

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**Nyanza Chemical Waste Dump Superfund Site
Explanation of Significant Differences
August 2006**

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I. INTRODUCTION

A. Site Name and Location

Site Name: Nyanza Chemical Waste Dump Superfund Site (Site)

Site Location: Ashland, Middlesex County, Massachusetts

B. Lead and Support Agencies

Lead Agency: United States Environmental Protection Agency (EPA)

Support Agency: Massachusetts Department of Environmental Protection (MassDEP)

C. Legal Authority

Under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617 (c), Section 300.435(c) of the National Contingency Plan (NCP), 40 C.F.R. § 300.435(c)(2)(I), and Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-02, if EPA determines that differences in the remedial action significantly change but do not fundamentally alter the remedy selected in the Record of Decision (ROD) issued on September 23, 1991 with respect to scope, performance, or cost, EPA shall publish an Explanation of Significant Differences (ESD). The ESD shall explain the differences between the remedial action being undertaken and the remedial action set forth in the ROD for Operable Unit 2 (OU2), and the reasons such changes are being made.

D. Summary of Circumstances Necessitating this Explanation of Significant Differences

Dense Non-Aqueous Phase Liquid (DNAPL)

The Nyanza Superfund Site (Site) is located in Ashland, Massachusetts (see Figure 1). The Site was used as a dye manufacturing facility from the 1910's until 1978. EPA has completed various soil and sediment removal activities at the Site and is currently studying the down stream portions of the Sudbury River. The focus of this ESD is on OU2, which addresses groundwater related concerns.

The original September 4, 1985 ROD for the Site specified a source control remedy that involved the excavation and on-site capping of various sludges, and associated soil and sediment from former lagoon areas. This ROD, now referred to as the Operable Unit 1 (OU1) ROD, also required further investigation of groundwater, and of possible additional source areas and wetlands. A second ROD was issued on September 23, 1991 that selected a Management of Migration remedy for groundwater.(OU2). The 1991 ROD was written as an Interim Remedy, with the intent to further evaluate the effectiveness of

groundwater extraction and treatment in meeting drinking water standards after an initial 5-year operational period.

In accordance with the 1991 ROD, EPA began design of a groundwater extraction and on-Site treatment system in 1992. In 1994, a pilot-scale treatment system was constructed, that was intended to refine extraction rates and treatment processes.

However, when EPA started the pilot-scale treatment system, dense non-aqueous phase liquid (DNAPL) was discovered in a pump test extraction well located on the northern portion of the Site. DNAPL is highly-concentrated free-phase product that has sunk to the bottom of the aquifer. It is denser and more contaminated than the groundwater. The presence of the DNAPL raised concerns about the effectiveness of the planned extraction and treatment remedy. The treatment system was not designed to handle influent containing DNAPL. As a result, the pilot-scale treatment system was not tested and the full-scale design was postponed indefinitely.

A groundwater monitoring program was initiated in 1998 to assess plume migration and any changes in contaminant concentrations. Another important objective for collecting this data was to determine if the DNAPL is an ongoing source of continued groundwater contamination. Approximately 30 wells were sampled on a semi-annual basis for volatile organic compounds (VOCs), semi-VOCs and metals. Elevated concentrations were found in both the overburden (shallow) and bedrock groundwater that exceed federal and state drinking water standards. The monitoring program continued through the fall of 2003. The results indicated that the plume is generally stagnant such that contaminant concentrations have remained relatively unchanged and the overall plume is neither expanding nor contracting. These findings suggest that the DNAPL is an ongoing source of groundwater contamination.

The entire impacted area is served by a public water supply and there are no known drinking water wells located within the contaminated groundwater plume area.

Vapor Intrusion

VOCs in groundwater have a tendency to transfer from the liquid phase to the vapor phase, where the vapors may then travel upward through the soil and pass through basement floors, walls and slabs into indoor air space particularly where the groundwater is relatively close to the ground surface. Once inside a structure, these vapors may collect to such a point that continued inhalation of the vapors could result in unacceptable exposure risks to people in these buildings. This phenomenon is referred to as the vapor intrusion pathway.

Elevated concentrations of certain VOCs, trichloroethene (TCE) in particular, within the contaminated groundwater plume prompted EPA to conduct an indoor air sampling program in 1998. The plume is present in shallow groundwater north and east of the Nyanza Site, and extends under numerous homes, businesses and municipal buildings. The objective of the sampling program was to determine if contaminants in groundwater

were migrating into homes and other structures at concentrations that are measurable, and may result in potentially unacceptable inhalation risks. As a first step in such an evaluation, EPA employs “screening levels” as an initial indication of risk to help determine if whether additional evaluation may be appropriate. TCE and four other contaminants were detected in eight (8) of the nine (9) homes sampled, and at the Town Hall and police station. TCE was detected at concentrations ranging from 6.4 to 7.3 $\mu\text{g}/\text{m}^3$, which were all below the screening level of 134 $\mu\text{g}/\text{m}^3$ that was in existence at the time.. Therefore, these levels were determined to not pose an unacceptable inhalation risk at that time.

In the past few years, EPA has reevaluated the potential risk posed by the vapor intrusion pathway. In November 2002, EPA issued its Draft Guidance for Evaluating Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. This Guidance provided suggested approaches for evaluating the vapor intrusion pathway and also established new, lower screening criteria for evaluating potential risk.

Based on the TCE detections and continued elevated concentrations in groundwater previously discovered, a second indoor air sampling program was conducted in 2004. TCE and four other contaminants were detected in five (5) of the seven (7) homes sampled. The Town Hall and police station were not sampled. TCE was detected at concentrations ranging from 1.3 to 2.9 $\mu\text{g}/\text{m}^3$, which were all below the existing screening level of 134 $\mu\text{g}/\text{m}^3$. However, based upon new toxicity information regarding the risk from TCE, the screening level range was recalculated to a proposed range of 2 to 43 $\mu\text{g}/\text{m}^3$, which is significantly lower than the 134 $\mu\text{g}/\text{m}^3$ screening level previously used. Concentrations of TCE in three (3) of the homes exceeded the lower end of the proposed screening range. Exceedances of the proposed screening level range prompted EPA to make a proactive and conservative decision to perform a risk assessment on all the available air data from Nyanza to determine if potentially unacceptable inhalation risks are possible using the proposed toxicity information for TCE. This tiered screening and risk assessment approach is consistent with EPA’s November 2002 draft Guidance. The risk assessment concluded that use of the proposed TCE toxicity information results in a potentially unacceptable risk from continued long-term inhalation of TCE vapors in seven (7) of the fourteen (14) homes sampled, and in the Town Hall.¹ No potentially unacceptable inhalation risks are present if the older toxicity information for TCE is used.

Summary of ESD Actions

The ESD requires;

1. Extraction of DNAPL with off-site treatment and disposal of the extracted DNAPL with possible enhancements.

¹ The Town of Ashland voluntarily installed a passive vapor mitigation system during extensive renovations to the Town Hall in 2005.

2. Performance of routine groundwater monitoring to assess any changes in plume concentrations and migration;
3. The installation, on a voluntary basis, of vapor mitigation systems in approximately 40 to 50 structures (mostly homes) located in the northeast portion of the plume, in an area generally bracketed by Tilton Ave. and Water St. to the west, the Sudbury River to the north and to the east, and the rail road tracks to the south;
4. Performance of additional air testing, on a voluntary basis, at approximately ten (10) to fifteen (15) additional homes and businesses located above remaining areas of the plume, generally described as areas immediate west of Forest St and southeast of the Town Hall along Main St.. These homes and businesses have not yet been selected; and,
5. Installation of small diameter monitoring wells or piezometers in the areas generally described in #4 above to more accurately determine the extent of the shallow groundwater plume.

In addition, this ESD provides clarification on the use of institutional controls to prevent exposure to contaminated groundwater.

E. Availability of Documents

This ESD and supporting documentation shall become part of the Administrative Record for the Site. An index of information being added to the Administrative Record for this ESD is attached as Appendix A. The full Administrative Record, including its index, is available to the public at the following locations and may be reviewed during the times listed:

U.S. Environmental Protection Agency
Records Center
One Congress Street
Boston, MA 02114
(617) 918-1440
Monday through Friday 9:00 am. to 5:00 pm.

Ashland Public Library
66 Front Street
Ashland, MA 01721
(508) 881- 0134
SUMMER HOURS - Tuesday through Thursday 10:00 am to 8:00 pm. Friday
2:00 pm to 5:00 pm. Saturday 10:00 am to 5:00 pm.

This ESD and other key documents are also available for review on the internet at www.epa.gov/region1/superfund/sites/nyanza. You will need Adobe Reader to view the documents.

II. SUMMARY OF SITE HISTORY, CONTAMINATION PROBLEMS, AND SELECTED REMEDY

A. Site History and Contamination Problems

In June 1987, EPA authorized the initiation of investigative activities for OU2 to address contaminated groundwater migrating from the Site. The Remedial Investigation (RI) and Feasibility Study (FS) were completed in 1991. The interim ROD for OU2 was signed on September 23, 1991. The selected remedy included extraction and treatment of the most contaminated groundwater at the Site, for a minimum of five years, and conducting additional studies before selection of a final groundwater remedy.

Primary components of the interim OU2 ROD included;

- Extraction of groundwater near the northern portion of the Site for a period of 5 years,
- Construction of an on-site treatment plant to remove contaminants from the groundwater;
- Discharge of treated effluent to the Sudbury River;
- Development of institutional controls to limit exposure;
- Performance of pump tests in the eastern portion of the Site;
- Installation of bedrock monitoring wells to fully define the extent and depth of contamination;
- Performance of continued monitoring of select Site wells, residential wells and surface water stations;
- Inspection of the Megunko Road waterline; and
- Performance of pre-design studies to determine necessary parameters for the planned extraction and treatment system.

Given the significant uncertainty regarding the ability to effectively restore the groundwater to drinking water standards, the 1991 interim ROD did not establish any specific cleanup targets. The general goal of the ROD was to extract and treat groundwater for a fixed five-year period to assess overall performance. Following the five-year period, EPA would issue a final ROD for OU2 with specific groundwater cleanup targets, as appropriate.

B. 1991 Interim OU2 ROD Activities Completed to Date

Technical design studies for the selected remedy began in early 1992 by EPA's consultant, Ebasco Services. The discovery of DNAPL in 1994 during the installation of a pump-test groundwater extraction well in the northern portion of the Site raised concerns about the effectiveness of a pump and treat remedy. DNAPL is a highly-concentrated product that has sunk to the bottom of the aquifer. It is denser and more contaminated than the groundwater. A pilot-scale treatment system had been constructed; however, it

was not designed to treat an influent containing DNAPL. As a result of the DNAPL discovery, the pilot-scale system was not tested and the full-scale design was postponed. Since this time, EPA has been collecting additional data and examining other options for treating the groundwater contamination at the Site. Refer to Section III.A below for planned activities to address the DNAPL.

Groundwater monitoring was initiated in 1998 on a semi-annual basis and continued until the Fall of 2003. A number of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals were detected at elevated concentrations in the overburden and bedrock groundwater at the Site. The primary contaminants included: chlorobenzene, dichlorobenzene, nitrobenzene, trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride, and mercury. Elevated contaminant concentrations are present in plumes extending from Megunko Hill to the north and northeast, with plume migration toward and discharging into the Sudbury River. The DNAPL present in the aquifer beneath the northern portion of the Site continues to be a source to the larger dissolved-phase contaminant plume in groundwater, and specifically the shallow overburden groundwater. The monitoring data also concludes that the groundwater contaminant concentrations and plume extent are neither increasing nor decreasing. While the contaminant concentrations exceed federal and state drinking water standards, the Town of Ashland does not use groundwater from the contaminated plume for their drinking water supply.

The results of the semi-annual groundwater monitoring prompted EPA to undertake indoor air sampling programs in 1998 and 2004 to determine if contaminants in the groundwater were volatilizing and migrating into homes and businesses at levels that might affect public health. EPA had previously performed indoor air sampling at five homes and the Town Hall in 1990. The results indicate that the incremental cancer risks would exceed EPA's risk range of 1×10^{-6} to 1×10^{-4} , when proposed toxicity information for TCE is applied, in some of the residential houses where indoor air samples were collected, as well as at the Ashland Town Hall. Refer to Section III.B below for planned activities to address indoor air concerns.

Between 1999 and 2003, several studies were also conducted to evaluate potential ecological risks posed by the groundwater plume discharging into the Sudbury River. Results indicate that aquatic life was impacted in one of the three areas studied, but that these impacts could not definitively be tied to the groundwater plume or other existing natural habitat conditions such as storm water runoff, low dissolved oxygen levels, stagnant water, and high amounts of detritus (leaf litter).

While the 1991 interim OU2 ROD required a pump and treat remedy to address the more contaminated groundwater, the discovery of DNAPL in the aquifer raised concerns about the effectiveness of this remedy. Therefore, this document reflects a focus on the free-phase DNAPL identified at the Site, as a source removal and control effort, and as a precursor to any potential remediation of the groundwater.

This document also addresses potentially unacceptable inhalation risks by eliminating exposure to vapors migrating from the more contaminated portions of the groundwater plume to indoor air space in nearby structures through the installation of active vapor mitigation systems. An air sampling program will be performed to assess the need to install additional mitigation systems.

III. BASIS FOR ESD

This ESD does not modify the general goals for groundwater remediation established in the 1991 interim ROD, but rather furthers these goals through physical source extraction and by putting in place engineering controls in the form of vapor mitigation systems to prevent ongoing inhalation exposures. EPA anticipates issuing a Final ROD for OU2 following the evaluation of the effectiveness of DNAPL extraction and treatment.

A. Groundwater Use

The Nyanza Site is located within a 1/2 mile of a state designated potentially productive high yield aquifer; however groundwater is currently not used for drinking water in the vicinity of the Site.

B. Vapor Intrusion

Concerns related to the potential infiltration of vapors into homes, businesses and other structures were not envisioned at the time that the 1991 interim ROD was prepared. Some indoor air sampling had been performed by EPA in 1990, but results did not exceed screening levels and initial EPA guidance on how to assess vapor intrusion concerns was not issued until 1996. Since that time, air sampling methodologies, data evaluation techniques, air pathway models and EPA guidance have advanced; however assessing vapor intrusion concerns is still an evolving area of science.

The available air data collected consists of three rounds (1990, 1998, and 2004) of indoor air sampling conducted in the vicinity of the Site by EPA Region 1's laboratory. Based on the data provided, a total of fourteen (14) residences and two municipal buildings (Ashland Police Station and Ashland Town Hall) were sampled by EPA. Available indoor air data for five target compounds (TCE, vinyl chloride, chlorobenzene, benzene, and 1,4-dichlorobenzene) were included in EPA's sampling program. Target compounds were selected by EPA based on the contaminants identified from the groundwater data, which had the highest concentrations and the greatest potential to volatilize out of groundwater and migrate into buildings.

The results from all three indoor air sampling events are summarized as follows:

- **Indoor Air Sampling 1990** - Five (5) homes and the Town Hall were sampled. TCE was detected in the Town Hall only. Benzene was detected in three (3) of

the homes and the Town Hall. Chlorobenzene was not detected. Vinyl chloride and 1,4-dichlorobenzene were not sampled. None of the detected concentrations exceeded the screening level of $134 \mu\text{g}/\text{m}^3$.

- **Indoor Air Sampling 1998** - Nine (9) homes, the Town Hall and the police station were sampled. TCE was detected in eight (8) of the homes, the Town Hall and the police station. Vinyl chloride was detected in two (2) of the homes. Benzene was detected at all locations. Chlorobenzene was detected in one (1) home. 1,4-dichlorobenzene was detected in six (6) of the homes, and the Town Hall and police station. None of the detected concentrations exceeded the screening level of $134 \mu\text{g}/\text{m}^3$.
- **Indoor Air Sampling 2004** - Seven (7) homes were sampled. TCE was detected in three (3) of the homes. Benzene was detected in five (5) of the homes. Vinyl chloride and 1,4-dichlorobenzene were not detected. Results for TCE exceeded the lower end of the proposed screening range, based upon proposed revised toxicity information for TCE, of 2 to $43 \mu\text{g}/\text{m}^3$. One (1) sample for benzene also exceeded the lower end of its screening range; however the source of this benzene is likely attributable to petroleum products stored in the basement at the time of the sampling.

Complete results from all three indoor air sampling events are attached in Table 1. Figure 2 shows the corresponding sampling locations.

As discussed previously, in 2001, EPA proposed revisions to the toxicity of TCE, which would result in lowering the screening levels for TCE. This proposed lower standard for evaluating potential inhalation risks from vapor intrusion of TCE in groundwater to indoor space prompted a review of all three rounds of available indoor air data for the Nyanza Site. EPA's consultant, ICF, conducted a focused risk assessment to evaluate potential inhalation risks, and issued a report titled, Indoor Air Human Health Risk Assessment, October 25, 2005. When the proposed toxicity information for TCE is applied, the results indicate that the incremental cancer risks exceed EPA's acceptable risk range of 1×10^{-6} to 1×10^{-4} in seven (7) of the fourteen (14) homes where indoor air samples were collected, as well as at the Ashland Town Hall. An exceedance of 1×10^{-4} means that an average person could expect to have a 1 in 10,000 *increased* chance of developing cancer from chronic inhalation of these vapors. Risks were predominately attributable to TCE vapors. The maximum risk calculated was 1.7×10^{-3} . It should be noted that EPA's exposure assumptions used to reach this conclusion are conservative. For example, in quantifying potential inhalation risks, EPA assumed a person may be exposed to vapors in their basement for 350 days/year for 30 years. This approach to assessing potential risk is referred to as a "reasonable maximum" exposure scenario.

It should also be noted that there are also many uncertainties with regard to assessing the vapor intrusion pathway. Each home is constructed differently. Vapors are more

likely to intrude into homes with dirt basement floors. Vapors are more likely to collect in well insulated basements. Some home owners routinely open their windows. Some homes have forced air heating and cooling systems. Soil characteristics beneath each home vary widely with regard to the ability to transport vapors. Also, samples of vapors in air are collected and averaged over a 24 hour period. Those results must be extrapolated over a 30 year period, although in reality vapor concentrations can vary widely from day to day, and will fluctuate seasonally.

Modeling (or predicting) potential indoor air concentrations based on known groundwater data is another method to assess potential inhalation risks and account for the various uncertainties. A modeling effort was conducted by ICF to evaluate the potential risks in a “typical house or business” located above the contaminated shallow groundwater plume. The results are presented in the October 25, 2005 risk assessment report and predict an unacceptable incremental cancer risk related to vapor intrusion potentially in all buildings located above the shallow groundwater plume. TCE represents the majority of the estimated cancer risk.

IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES

This Explanation of Significant Differences (ESD) does not modify the general goals for groundwater remediation established in the 1991 interim ROD, but rather furthers these goals through physical source extraction of DNAPL and by putting in place engineering controls in the form of vapor mitigation systems to prevent potential inhalation exposures. The ESD also reestablishes a groundwater monitoring program, includes the installation of additional monitoring wells and requires additional collection of indoor air data to address the objectives described below.

A. DNAPL Evaluation

As explained above, an area of Dense Non-Aqueous Phase Liquid (DNAPL) was encountered in a pump test extraction well, now referred to as monitoring well MW-113A, in 1994. Efforts were put forth to characterize the nature and extent of DNAPL present, and evaluate whether the DNAPL is an ongoing source of contamination in the dissolved groundwater plume. EPA’s consultant, ICF, has completed the necessary field studies and has evaluated several alternatives to address the DNAPL. ICF issued a report titled, “DNAPL Alternative Memorandum,” June 16, 2006. The major findings in this report are summarized as follows:

- **Sources of the DNAPL** - The areas that potentially contributed to the presence of DNAPL at Nyanza include: the former concrete "vault," two lined lagoons previously located south of Megunko Road, two settling ponds (Pond 1 and Pond 2) previously located south of Megunko Road, the former dump on Megunko Hill, Chemical Brook, and Area E in the lower industrial area between Megunko Road and the railroad tracks. The most significant source of DNAPL was the former

concrete vault. All of these areas have been remediated by EPA, so there is no contributing or ongoing source to the DNAPL in groundwater.

- **Physical Composition of the DNAPL** - The DNAPL is dark brown/black in color and exhibited a strong almond-like odor. The compounds detected in the DNAPL are consistent with dye manufacturing operations and include TCE, chlorobenzene, dichlorobenzene, trichlorobenzene and nitrobenzene, with minimal amounts of petroleum-related hydrocarbons. The density of the DNAPL is 1.233 g/mL, which is greater than that of water (1.000 g/mL) and is why it has sunk to the bottom of the aquifer. The DNAPL also has a viscosity that is slightly higher than water, meaning it is similar in thickness to spray paint or stain.
- **Extent of DNAPL in the Aquifer** - A series of monitoring wells were installed in the vicinity of MW-113A in an effort to define the full nature and extent of DNAPL present. Initial testing indicated the presence of DNAPL in up to 15 monitoring wells covering a lateral area of about 2 acres. However, further studies were unable to confirm the presence of DNAPL in these wells, or in a series of soil borings installed in the area. DNAPL has only been confirmed in MW-113A, at up to 3.5 feet in thickness and in RW-1 at up to 4.4 feet in thickness. These findings suggest that the actual lateral extent of DNAPL is closer to 1 acre and the DNAPL plume is likely closer to 1 foot in thickness. The extent of DNAPL is difficult to determine because it is located about 40 to 50 feet below ground surface, at the bedrock interface. Geophysical investigations confirm that the upper 20 feet of the bedrock is highly fractured. It appears that the DNAPL has migrated into these shallow fractures where it is then conveyed to the north and east, and discharges into the shallow groundwater aquifer. It is also possible that the DNAPL has sunk into the deeper bedrock fractures and the DNAPL may in fact have sorbed into the matrix of the intact rock, either at the surface or on the surfaces of the fractures. However, it appears that the volume of sorbed DNAPL, if any, is small in comparison to the free-phase DNAPL.
- **DNAPL Migration** - Area bedrock is highly fractured within the top 20 feet and able to convey free-phase DNAPL. Geophysical studies verify that the fractures beneath the Site dip in a north-northeast direction. Once in the bedrock, the DNAPL appears to be conveyed within an elongated bedrock depression, trending in a west to east direction. The fractures then rise, discharging the DNAPL into the shallow overburden aquifer. This is a slow and continuous process, which is further verified by the stagnant nature of the dissolve phase groundwater plume.

These results indicate that a pool of highly contaminated DNAPL located about 40 to 50 feet deep at the bottom of the aquifer and within the fractures of the top 20 feet of bedrock, extending over about a 1 acre area, continues to act as a source for groundwater contamination. Figure 3 shows the general DNAPL area. The conclusion was reached that the DNAPL must be removed or otherwise addressed for any successful remediation of groundwater to be possible.

A wide range of general response actions was also evaluated to determine the best course of action to address the DNAPL. Based on the results of this evaluation, physical extraction employing a variety of techniques with possible enhancements and off-site treatment of the DNAPL appeared to be the best option.. Extraction technologies considered included recovery pumps, belt skimmers, vacuum trucks, bailers and absorption products. These technologies could possibly be enhanced through the use of injection wells, surfactant flushing, thermal enhancement or pneumatic fracturing,

B. Description of Components of this ESD

1. Source Extraction of DNAPL with Possible Enhancements

Source extraction of DNAPL involves the physical extraction of DNAPL from the deep aquifer, and possibly shallow bedrock fractures, through the use of belt skimmers, pumps or a similar extraction method, such as peristaltic and/or hydrophobic filter pumps, or intermittent use of a vacuum truck in wells with measurable DNAPL. Given EPA's uncertainty regarding the ability to locate and extract the DNAPL, EPA intends to employ various extractions methods, and use possible enhancements, to make every effort to effectively eliminate the DNAPL as an ongoing source of groundwater contamination. The preferred extraction method(s) will require a slow but continuous, or nearly continuous, extraction process matched closely to the DNAPL inflow rates. Belt skimmers employ this method and rely on the difference in surface tension between oil and water. A continuous loop oleophilic belt is passed through the free-phase DNAPL, which is then absorbed onto the belt and brought to the surface. The water is left behind. The DNAPL is removed by passing the belt through tandem wiper blades, which scrape off both sides of the belt. Regardless of the exact extraction method(s) to be used, once recovered the DNAPL will then be containerized in a tank or drums for off-site treatment. Given the specific physical qualities and location of DNAPL at the Site, recovery rates may be as low as 1 gallon of DNAPL per well per day. Up to 50 extraction wells may be installed. However given the difficult geologic conditions at the Site, and the inability to locate DNAPL in monitoring wells and soil borings installed during the investigation, belt-skimmers will initially be installed in 5 wells, and existing wells MW-113A and RW-1, to the extent practicable. Depending on the success of DNAPL extraction from these 5 to 7 wells, EPA may install additional extraction wells up to a total of 50, each equipped with a continuous loop belt skimmer, pump or a similar extraction method. The location of the proposed extraction wells, and exact extraction method(s) to be used shall be determined during the design phase. Figure 4 shows a general schematic of a typical belt skimmer system.

It is expected that the belt skimmers, or a similar extraction method or methods, will continue to operate until no more free-phase DNAPL is recoverable or until EPA makes a final remedy decision for groundwater. It is EPA's goal to make a final remedy decision for groundwater within five years following start-up of the extraction system.

If, after a reasonable period of operation not to exceed approximately five years from system start-up, it appears that the belt skimmers or similar extraction technologies such as peristaltic and/or hydrophobic filter pumps, or intermittent use of a vacuum truck in wells with measurable DNAPL, are not effective, EPA may also consider enhancement of the physical extraction through the use of injection wells, surfactant flushing, thermal enhancement or pneumatic fracturing. If the enhanced use of belt skimmers, pumps or vacuums is still not effective, EPA may evaluate other alternatives. Any modifications or enhancement technologies employed will be consistent with the goals of this ESD (i.e., removal of the DNAPL as an ongoing source of groundwater contamination). MassDEP will be consulted regarding any proposed design changes and enhancements.

2. Vapor Mitigation Systems (Engineering Controls)

This ESD also requires installation of vapor mitigation systems in structures (primarily homes) located above the most contaminated area of the plume. This area of approximately 40 to 50 structures (mostly homes) is generally bracketed by Tilton Ave. and Water St. to the west, the Sudbury River to the north and to the east, and the rail road tracks to the south (see Figure 2). This area was selected because:

- a. Nearly all structures that were sampled for vapors in indoor air within this area exceed EPA's proposed target risk range based on inhalation of vapors;
- b. Concentrations of contaminants in groundwater beneath this area, particularly TCE, are the highest within the overall plume; and
- c. Modeling suggests that all structures within this area may be susceptible to inhalation risks from vapor intrusion.

These multiple lines of evidence support selection of this area.

The active vapor mitigation systems consist of small diameter PVC pipes, which are attached to a continuously operated fan. The system works by installing one or more pipes through the basement floor and into the sub-slab area. The piping is then routed outside the home and above the roof line where the vapors are allowed to discharge into the atmosphere. Once discharged, the vapors are diluted and no longer pose a potential threat. A single small-diameter 90 watt fan is placed along the piping route (outside) to maintain a positive pressure and continually draw the vapors from the sub-slab to the atmosphere. A diagram of a typical active vapor mitigation system is shown in Figure 5.

Basements would be surveyed and inspected prior to system installations. Cracks in concrete walls or floors, and gaps in field stone walls will need to be sealed. Sump pits will need to be covered. Concrete floors will need to be poured, or a vapor barrier membrane will need to be installed in homes with dirt basements. The cost of these actions is included in the costs of this ESD. A pressure test will be performed on each installed system to ensure that it is functioning properly. No additional sampling of indoor air for vapors is planned once a system is certified to be functioning properly.

Once installed, the systems will be inspected every 5 years to ensure continued proper operation, or more frequently as necessary.

EPA will notify property owners and occupants of structures within the proposed installation area that upon the agreement of the property owner, EPA will install an active vapor mitigation system, and thereafter MassDEP will maintain it, all at no cost to the owner. The property owner will be responsible for the cost of electricity to operate the system, estimated at approximately \$3 to \$10 per month (the cost of running the small fan), depending on the size of the structure and type of system. The property owner and any occupants will also be responsible for notifying the government if the system is damaged or if the fan stops running. Damage resulting from the routine operation of the systems will be repaired by MassDEP. Damage resulting from the property owner/occupant actions will be their responsibility. Property owners will be asked to provide the government continued access to periodically inspect and repair the system. Property owners who agree to have the system installed in their structures will be required to sign an agreement setting forth the above terms.

If the property owner of any structure does not accept this offer to have the vapor mitigation system installed, the government may record a notice at the Registry of Deeds to provide subsequent purchasers with notice regarding this potential problem. In addition, a letter will be placed on file with the Ashland Board of Health, and in the Site repositories, documenting that corrective measures were not taken to address this problem. For multi-family residences, additional notifications to current or prospective tenants may also be appropriate.

The Town Hall currently has a passive vapor mitigation system in place. If deemed necessary, EPA may offer to install a fan, or fans, on the passive vapor mitigation system to ensure that vapors are properly collected and vented.

3. Indoor Air Monitoring

Additional indoor air monitoring is proposed in structures located above the plume beyond the area where vapor mitigation systems are currently proposed to be installed. Systems will not be installed in these structures at this time because:

- a. None of the structures sampled for vapors in indoor air within these areas exceed EPA's target risk range; and
- b. Limited monitoring of groundwater indicates contaminant concentrations in these areas of the plume are much lower.

However, additional sampling of indoor air is warranted because the vapor intrusion model suggests that these structures are still potentially susceptible to inhalation risks from vapor intrusion. In addition, there are only a limited number of groundwater monitoring wells in this area. As a result, it is difficult to determine the exact areas where proposed screening levels may be exceeded, thereby triggering additional data collection

and an additional evaluation of the potential risk posed. There are approximately 50 to 60 structures (mostly homes) located above the less-contaminated areas of the plume. EPA intends to perform a single round of indoor air sampling in 10 to 15 of these structures (roughly 20 to 30%). If results conclude that any of the structures exceed EPA's risk range based on inhalation of vapors, and using the parameters contained in ICF's risk assessment report, additional vapor mitigation systems may be installed. The exact location and number of systems, if any, to be installed by EPA and maintained by MassDEP will depend on air sampling results, in conjunction with the additional groundwater data collected and in consideration of the existing indoor air model. If none of the sample results exceed EPA's risk range, this will confirm that these areas do not present a potential inhalation risk with regard to vapors. The protectiveness of the remedy will continue to be evaluated via periodic Five-year Reviews.

4. Groundwater Monitoring

EPA will reinstitute a groundwater monitoring program similar to the one discontinued in 2003, but on a once per year basis. A specific plan will be developed that includes sampling approximately 30 existing monitoring wells for the target contaminants including VOCs, SVOCs and metals (see Table 2 for specific monitoring wells to be included). The results will be used to measure any impact from the recovery of DNAPL, and to track any other changes in plume configuration and migration.

In addition, as indicated above, the location of shallow groundwater wells in the neighborhood areas is sporadic. EPA intends to install additional monitoring wells or piezometers throughout the plume area and primarily in public rights of way. These wells will be screened at the water table and sampled for VOCs only. The primary purpose of installing these shallow wells is to more accurately delineate the shallow VOC plume to further assess the need to perform additional indoor air sampling or install additional vapor mitigation systems. EPA anticipates resuming monitoring this fall or Winter, with well installation to follow in the Spring of 2007.

5. Additional Vapor Mitigation Systems

The installation of additional active vapor mitigation systems in other structures located above the plume, but outside the area identified in this ESD, may be required. In determining whether the installation of additional systems is appropriate, EPA will apply the same general criteria evaluated in this ESD. More specifically, EPA will consider the additional indoor air monitoring data collected in conjunction with the additional groundwater data collected, the results from the existing indoor air model, or any revisions there to. In determining whether indoor air results pose a potential unacceptable inhalation risk, EPA will apply the risk screening level range and risk assessment method based on the proposed TCE toxicity information.

Any additional installations of vapor mitigation systems will be consistent with the goals of this ESD (i.e., elimination of the indoor air pathway through the mitigation of potential

vapors). As is the case with the systems previously put in place, EPA will pay for any necessary improvements to the structure and MassDEP will pay for all maintenance and repairs as provided above. The property owner is expected to provide the electricity to run the systems. MassDEP will be consulted regarding any additional installations.

6. Institutional Controls

Although no one currently uses the groundwater for drinking water, there is nothing in place to prevent this from happening in the future. To address these potential risks, institutional controls are necessary to prevent the installation of new wells within, or in the vicinity of, the contaminated groundwater plume. Institutional controls are also necessary to prevent incidental ingestion of contaminants in shallow groundwater that could be encountered during excavations, such as for construction or utility installations or repairs.

There are no formal controls currently in place to prevent the installation of drinking water wells or contact with contaminated groundwater through excavation (i.e., deed restrictions or zoning bylaws). However the Town of Ashland's Board of Health and Building Department are both aware of the contaminated groundwater plume and have put in place informal procedures whereby local officials work closely with EPA and MassDEP to ensure that no drinking water wells are installed in or near the plume area, and that all construction activities that involve excavation, including the repair or installation of utilities, do not involve handling of contaminated groundwater. Local officials currently review all permit applications within the plume area to identify such activities. If drilling or excavation activities are proposed, the permittee is referred to EPA, who, in consultation with MassDEP, makes a determination whether or not the proposed excavation constitutes a potential health risk. The Building Department will not approve the final permit until EPA makes this determination. Similar safeguards may also be required to restrict new construction in the area of potential vapor intrusion risk unless they include measures to mitigate this risk.

In order to insure that the remedy remains protective in the long-term, this ESD requires institutional controls be put in place to formally prevent exposure to contaminated groundwater. EPA and MassDEP will work with the Town of Ashland's Board of Health and Building Department to put in place appropriate ordinances and/or regulatory requirements that will essentially formalize the process described above. Until such time as these requirements are put in place, EPA will continue the informal process.

V. COST

The net-present worth cost of the work described in this ESD is estimated at approximately \$3.6 million, but is dependant on the extraction technology used, the number and types of extraction wells installed, the number of vapor mitigation systems installed, and the scope of any additional monitoring efforts.

VI. SUPPORT AGENCY COMMENTS

MassDEP is considering the actions posed by this document and will make a final determination with regard to concurrence following completion of the public outreach process.

VII. STATUTORY DETERMINATIONS

EPA has determined that the selected remedy specified in the ROD for OU2, and the changes pursuant to this ESD, when implemented, would be protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate or waive such requirements as allowed by law, and are cost-effective. The actions proposed in this ESD utilize solutions and alternative treatment technologies to the maximum extent practicable for this Site at present time.

VIII. PUBLIC PARTICIPATION

This ESD and supporting information are available for public review at the locations identified within this document. In addition, a notice of availability of the ESD will be provided to a local newspaper of general circulation. EPA plans to approach the affected community, that is, all owners of property located above the contaminated plume through a series (two at a minimum) of public informational sessions. In these sessions, officials from EPA, MassDEP, Mass. Department of Public Health and the Town of Ashland will be available to provide information and answer questions. A broader public meeting will follow these informational sessions.

IX. DECLARATION

For the foregoing reasons, by my signature below, I approve the issuance of an Explanation of Significant Differences for Operable Unit 2 at the Nyanza Chemical Waste Dump Superfund Site in Ashland, Massachusetts and the changes and conclusions stated therein.

/DRAFT/

Susan Studlien, Director
Office of Site Remediation and Restoration
US EPA Region 1

Date

TABLES

Table 1

Table 1 Indoor Air Data, Nyanza OU II (in $\mu\text{g}/\text{m}^3$)

Sample Location	Trichloroethylene ($\mu\text{g}/\text{m}^3$)			Vinyl Chloride ($\mu\text{g}/\text{m}^3$)			Benzene ($\mu\text{g}/\text{m}^3$)			Chlorobenzene ($\mu\text{g}/\text{m}^3$)			1,4-Dichlorobenzene ($\mu\text{g}/\text{m}^3$)		
	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004
A	Basement	NA	5.4	NA	ND (0.51)	ND (0.72)	NA	1.0	1.3	NA	ND (0.92)	ND (1.2)	NA	0.24 L	ND (1.6)
	First Floor	NA	1.1 L	NA	ND (0.51)	ND (0.66)	NA	1.3	ND (0.83)	NA	ND (0.92)	ND (1.2)	NA	ND (1.2)	ND (1.6)
B	Basement	NA	NA	NA	NA	ND (0.61)	NA	NA	2.1	NA	NA	ND (1.1)	NA	NA	ND (1.4)
	First Floor	NA	NA	NA	NA	ND (1.2)	NA	NA	ND (1.4)	NA	NA	ND (2.0)	NA	NA	ND (2.6)
C*	Basement	NA	ND (1.1)	NA	ND (0.51)	NA	NA	1.3	NA	NA	ND (0.92)	NA	NA	ND (1.2)	NA
	First Floor	NA	ND (1.1)	NA	ND (0.51)	NA	NA	ND (0.64)	NA	NA	ND (0.92)	NA	NA	ND (1.2)	NA
D	Basement (concrete)	ND (5.4)	NA	NA	NA	NA	3.2	NA	NA	ND (32)	NA	NA	NA	NA	NA
E	Basement (concrete)	ND (5.4)	NA	NA	NA	NA	3.2	NA	NA	ND (32)	NA	NA	NA	NA	NA
	Ambient Air	ND (5.4)	NA	NA	NA	NA	9.6	NA	NA	ND (32)	NA	NA	NA	NA	NA
F	Basement	NA	5.4	NA	ND (0.51)	ND (0.72)	NA	9.6	ND (0.89)	NA	ND (0.92)	ND (1.3)	NA	ND (1.2)	ND (1.7)
	First Floor	NA	3.2	NA	ND (0.51)	NA	NA	7.7	NA	NA	ND (0.92)	NA	NA	ND (1.2)	NA
G*	Basement	NA	38	NA	ND (0.51)	NA	NA	2.9	NA	NA	ND (0.92)	NA	NA	ND (1.2)	NA
	First Floor	NA	27	NA	ND (0.77)	NA	NA	3.2	NA	NA	ND (1.4)	NA	NA	ND (1.8)	NA
H*	Basement	NA	4.8	NA	ND (0.51)	NA	NA	0.64 B	NA	NA	ND (0.92)	NA	NA	ND (1.2)	NA
	First Floor	NA	2.1	NA	ND (0.51)	NA	NA	1.6	NA	NA	ND (0.92)	NA	NA	0.060 B,L	NA
I	Basement, at floor level (fieldstone/concrete block walls, dirt floors)	ND (5.4)	NA	NA	NA	NA	ND (3.2)	NA	NA	ND (32)	NA	NA	NA	NA	NA
	Basement, 5' above floor	ND (5.4)	NA	NA	NA	NA	ND (3.2)	NA	NA	ND (32)	NA	NA	NA	NA	NA
	Basement, back corner	ND (5.4)	NA	NA	NA	NA	ND (3.2)	NA	NA	ND (32)	NA	NA	NA	NA	NA
J	Basement	NA	ND (1.1)	ND (1.4)	NA	ND (0.51)	NA	0.64 B,L	ND (0.83)	NA	ND (0.92)	ND (1.2)	NA	ND (1.2)	ND (1.6)
	First Floor	NA	1.1	ND (1.5)	NA	0.26 L	NA	1.6	ND (0.89)	NA	0.46 L	ND (1.3)	NA	0.60 L	ND (1.7)
K	Basement	NA	5.4	ND (1.6)	NA	0.51 L	NA	1.6	0.93 L	NA	ND (0.92)	ND (1.4)	NA	0.60 L	ND (1.8)
	First Floor	NA	2.1	ND (1.6)	NA	ND (0.51)	NA	1.3	0.86 L	NA	ND (0.92)	ND (1.3)	NA	2.4	ND (1.7)
L	Basement	NA	1.6	ND (6.4)	NA	ND (0.51)	NA	9.6	42	NA	ND (0.92)	ND (5.5)	NA	1.2 L	1.7
	First Floor	NA	1.1 L	ND (5.9)	NA	ND (0.51)	NA	6.4	23	NA	ND (0.92)	ND (5.1)	NA	0.60 L	ND (6.6)

Table 1 Indoor Air Data, Nyanza OU II (in $\mu\text{g}/\text{m}^3$) (continued)

Sample Location	Trichloroethylene ($\mu\text{g}/\text{m}^3$)			Vinyl Chloride ($\mu\text{g}/\text{m}^3$)			Benzene ($\mu\text{g}/\text{m}^3$)			Chlorobenzene ($\mu\text{g}/\text{m}^3$)			1,4-Dichlorobenzene ($\mu\text{g}/\text{m}^3$)		
	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004	Dec. 1990	Nov. 1998	May 2004
M															
Basement (fieldstone/concrete block walls, concrete floors)	ND (5.4)	8.6	2.5	NA	ND (0.51)	ND (0.59)	13	3.8	1.8	ND (32)	ND (0.92)	ND (1.0)	NA	ND (1.2)	ND (1.3)
First Floor	NA	10.2	1.3 L	NA	ND (0.51)	ND (0.72)	NA	4.5	1.3	NA	ND (0.92)	ND (1.2)	NA	0.24 B,L	ND (1.6)
N															
Basement (concrete walls and floor)	ND (5.4)	NA	NA	NA	NA	NA	ND (3.2)	NA	NA	ND (32)	NA	NA	NA	NA	NA
Ambient/ Background**	NA	1.1	ND (1.1)	NA	ND (0.5)	ND (0.13)	NA	2.6	0.48 L	NA	ND (0.92)	ND (0.92)	NA	ND (1.2)	ND (1.2)
Town Hall*															
Storage Area	22	11 (Oct.); 11 (Nov.)	NA	NA	ND (0.41) (Oct.); ND (0.51) (Nov.)	NA	3.2	0.67 (Oct.); 1.3 B (Nov.)	NA	ND (32)	ND (0.74) (Oct.); ND (0.92) (Nov.)	NA	NA	1.1 (Oct.); 0.60 L (Nov.)	NA
Health Office, floor level (1990 data only)	11	NA	NA	NA	NA	NA	ND (3.2)	NA	NA	ND (32)	NA	NA	NA	NA	NA
Health Office, 4' or 5' above floor	11	12 (Oct.); 11 (Nov.)	NA	NA	ND (0.41) (Oct.); ND (0.51) (Nov.)	NA	ND (3.2)	1.2 (Oct.); 1.3 B (Nov.)	NA	ND (32)	ND (0.74) (Oct.); ND (0.92) (Nov.)	NA	NA	1.4 (Oct.); 0.60 L (Nov.)	NA
Youth Advisory Board Room	NA	11 (Oct.); 5.4 (Nov.)	NA	NA	ND (0.41) (Oct.); ND (0.77) (Nov.)	NA	NA	0.77 (Oct.); 1.3 B (Nov.)	NA	NA	ND (0.74) (Oct.); ND (1.4) (Nov.)	NA	NA	1.5 (Oct.); 0.60 L (Nov.)	NA
Ambient Air		2.6			ND (0.41)			0.89 B			ND (0.74)			1.4 B	
Police Department*															
Dispatch Room	NA	0.54 L	NA	NA	ND (0.51)	NA	NA	1.3	NA	NA	ND (0.92)	NA	NA	0.60 B,L	NA

*Data from table entitled "Summary of November 1998 Indoor Air Results" provided as a separate electronic file (results2.wpd)

^The exact location of the ambient/background air from the "Summary of November 1998 Indoor Air Results" table is unknown.

NOTES: ND = Not detected above reporting limits

L = Estimated value, is below the calibration range

B = Analyte is associated with blank contamination

NA = Not applicable, no data collected

Table 2
Monitoring Wells

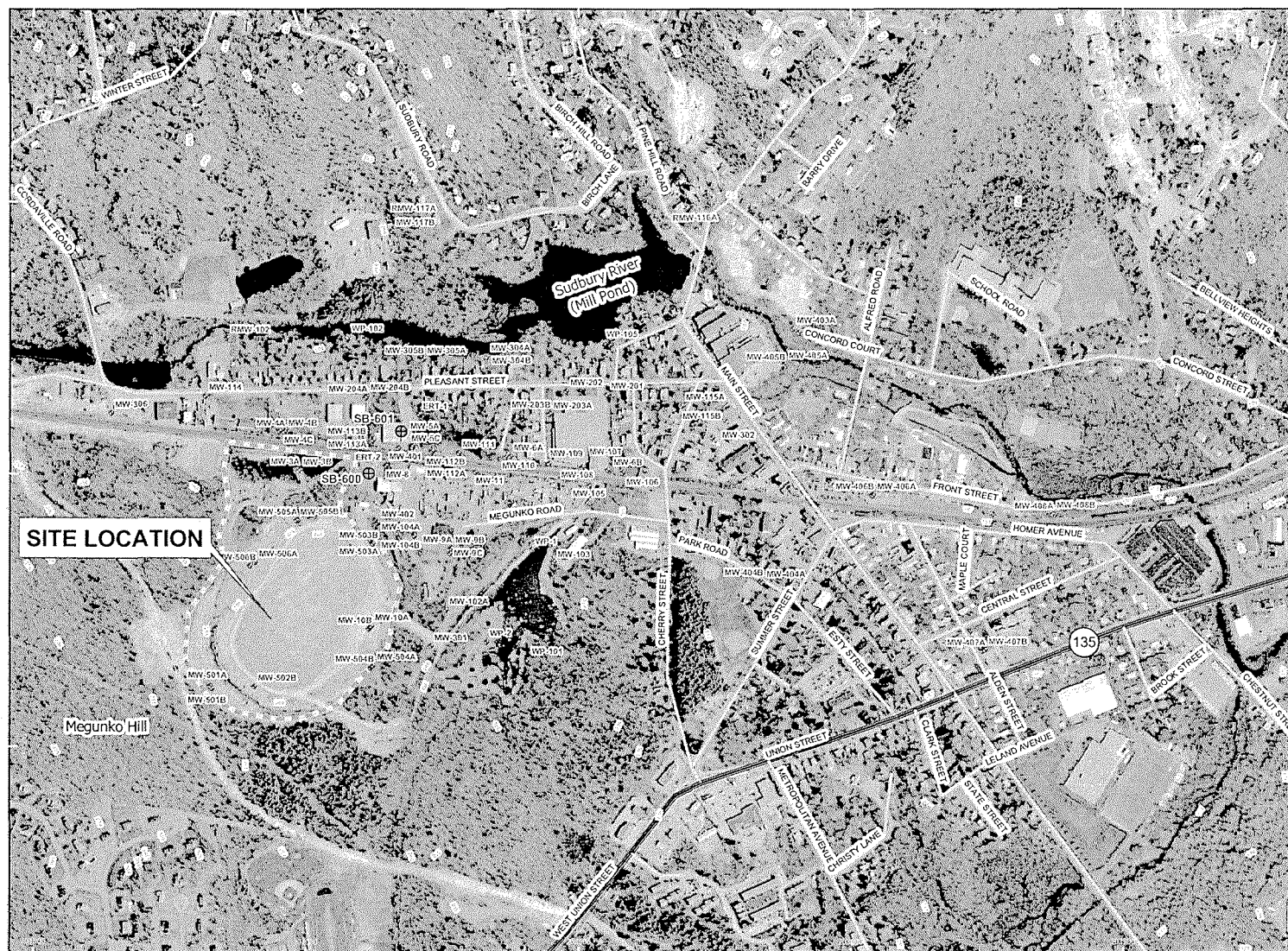
Well Number	Well Type	Date Sampled
MW-4B ✓	OB/BR	29-Oct-03
MW-6A ✓	OB	30-Oct-03
MW-6B ✓	OB	30-Oct-03
MW-9B ✓	BR	29-Oct-03
RMW-102 ✓	OB	28-Oct-03
MW-102A ✓	BR	28-Oct-03
MW-102B ✓	OB	28-Oct-03
WP-105 ✓	OB	28-Oct-03
MW-107 ✓	BR	30-Oct-03
MW-111 ✓	OB	03-Nov-03
MW-113B ✓	OB	31-Oct-03
MW-115A ✓	BR	31-Oct-03
MW-115B ✓	OB	31-Oct-03
MW-201 ✓	OB	29-Oct-03
MW-202 ✓	OB	29-Oct-03
MW-203A ✓	BR	31-Oct-03
MW-203B ✓	OB	31-Oct-03
MW-204A ✓	BR	30-Oct-03
MW-204B ✓	OB	30-Oct-03
MW-301 ✓	OB	28-Oct-03
MW-302 ✓	OB	30-Oct-03
MW-304A ✓	BR	30-Oct-03
MW-304B ✓	OB	30-Oct-03
MW-306 ✓	OB	28-Oct-03
MW-401 ✓	BR	31-Oct-03
MW-402 ✓	BR	03-Nov-03
RMW-403B ✓	OB	28-Oct-03
MW-405A ✓	BR	30-Oct-03
MW-405B ✓	OB	30-Oct-03

Notes:

BR = Bedrock

OB = Overburden

FIGURES

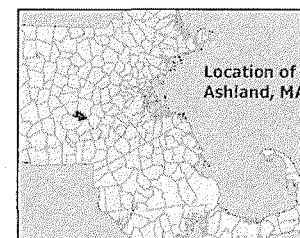


Legend

Existing Cap Fence
 Soil Boring Location
 Well Location
 Topographic Contours (Feet AMSL)

ROAD TYPE

Interstate
 U.S. Federal Route
 State Route
 Local



SPATIAL REFERENCE
 Coordinate System: Massachusetts State Plane
 Projection: Lambert Conformal Conic
 Datum: NAD 83
 Spheroid: GRS 1980
 Units: Meters
 False Easting: 750000 Meters
 Central Meridian: 71.5 Deg West
 Latitude of Origin: 41 Deg North

SOURCES
 ICF Consulting, Inc.
 U.S. Geological Survey
 Aerial Photos: State of Massachusetts MASSGIS
 Date of Aerial Photography: April 2001

FILE INFORMATION
 File Name: \CAD\COE_NYANZA\NyanzaFigure1-1 Spring 2003.mxd
 Last Edited: 10/29/2002 9:40:09 AM

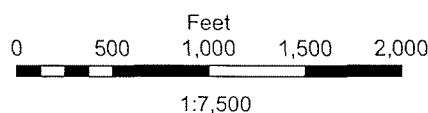
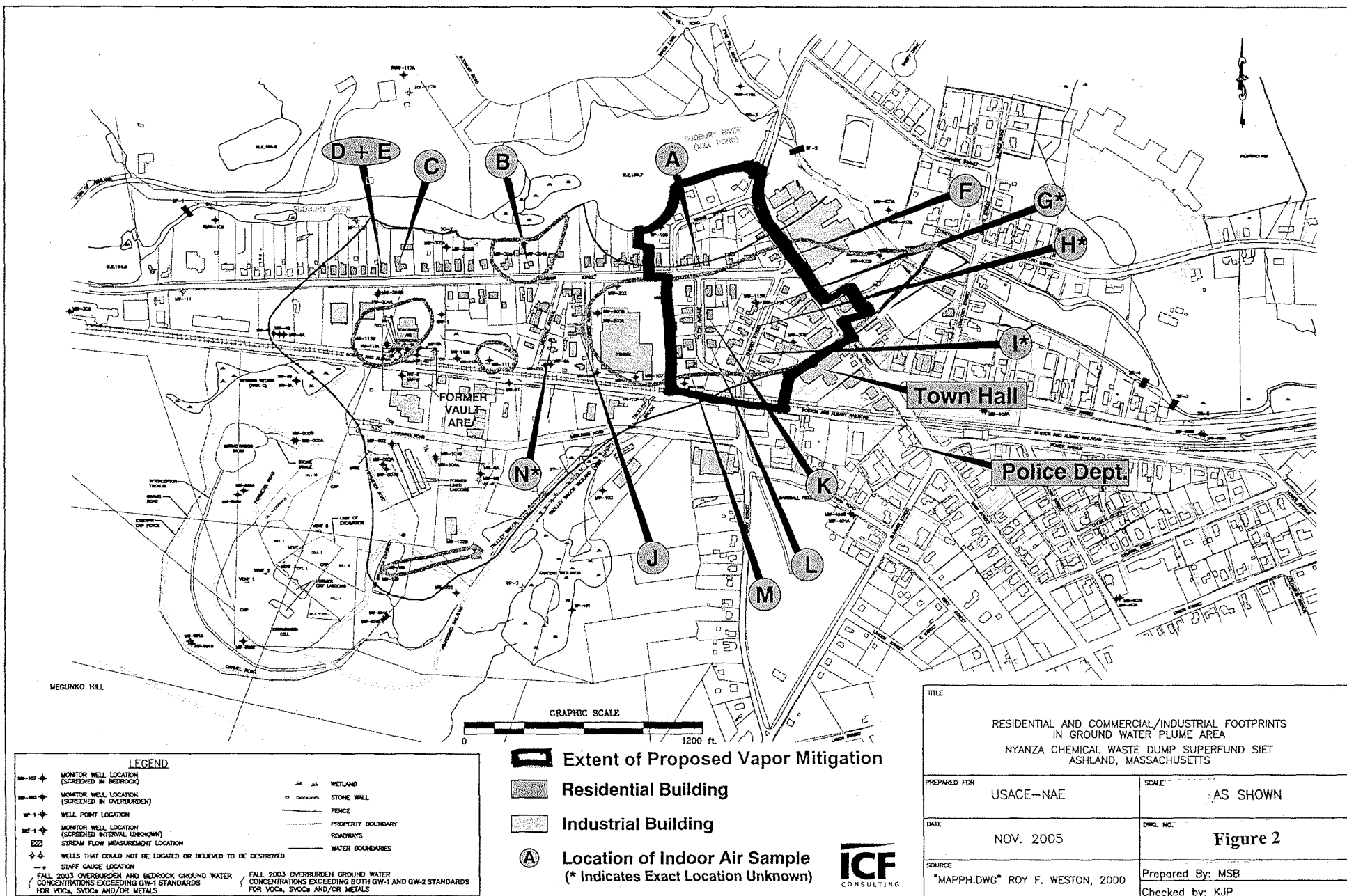


Figure 1
 Site Location Map
 Nyanza Chemical Waste Dump Superfund Site



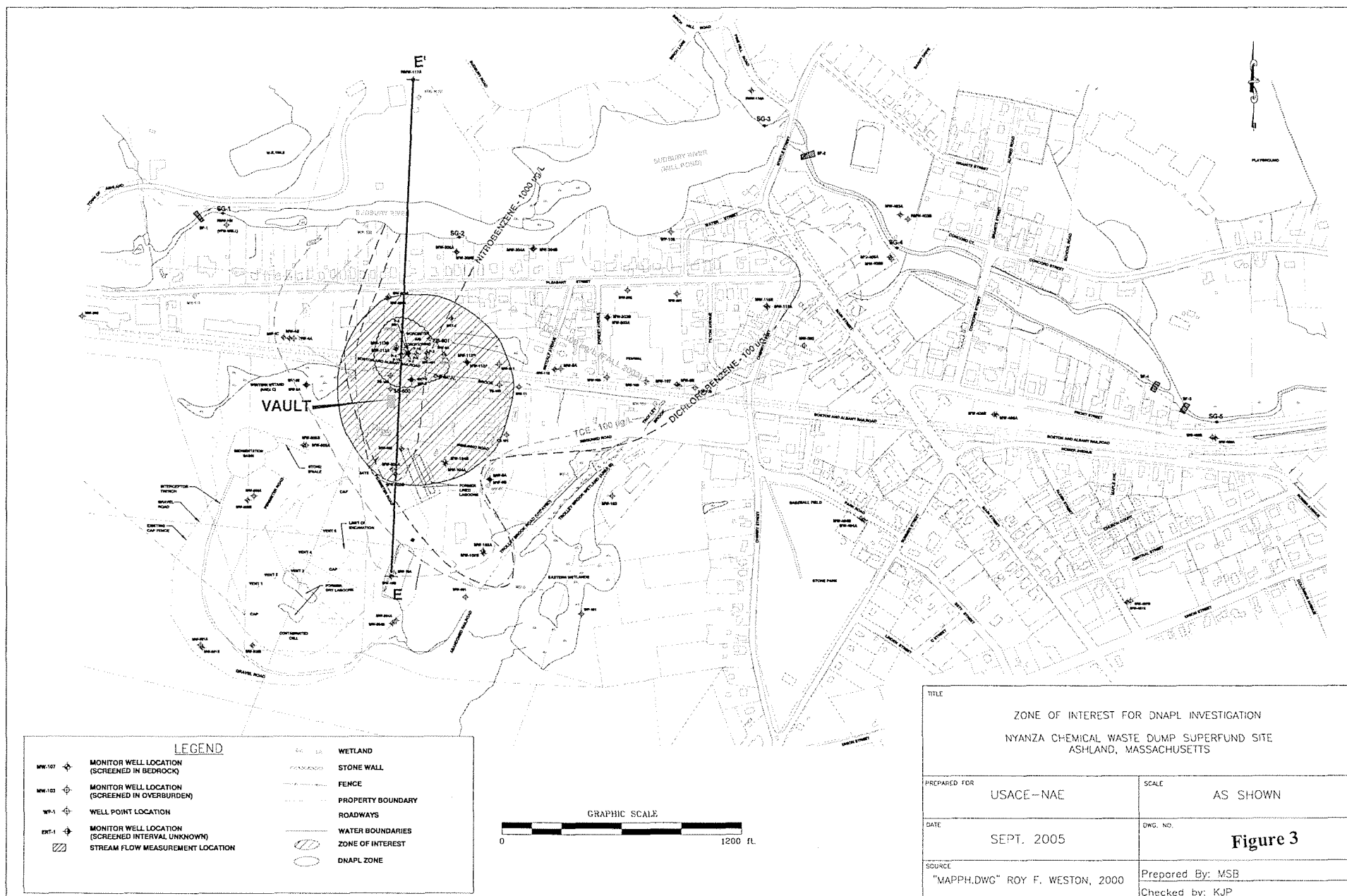


Figure 4
Typical
Belt Skimmer

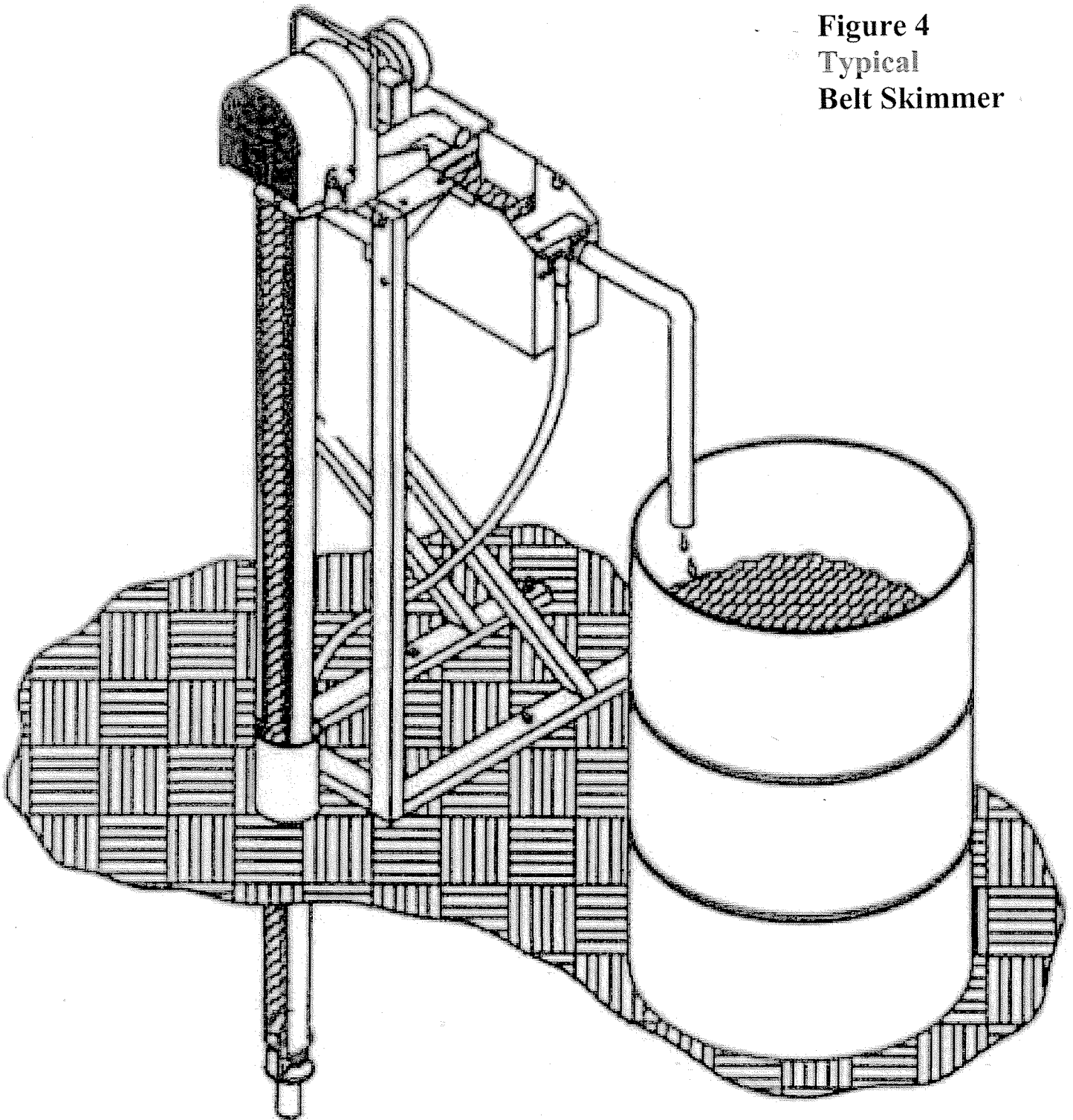


Figure 5

Typical Vapor Mitigation System

The techniques may vary for different foundations and site requirements, but the basic elements are:

A. Impermeable Barrier

A concrete floor or other suitable material is placed in dirt basements to reduce upward migration and allow a method of collecting vapors.

B. Sealing and Caulking

All openings and cracks in foundation floors and walls are sealed to reduce soil gas entry into the home.

D. Vent Pipe

A 2- to 4-inch gas-tight or PVC pipe (commonly used for plumbing) runs from beneath the slab or basement floor through the house to the roof to safely vent vapors above the house. Several vertical pipes may be installed through the slab or floor where placement of a horizontal pipe is not possible. The vertical portion of the pipe must often be installed outside in older homes and buildings.

E. Fan and Junction Box

An electrical junction box is installed for a small diameter electric venting fan. The fan must run continuously and is often placed outside the home.

